PONY in Math

Primary 6

SECOND TERM

Unit 1

Integers

Lesson 1

Revision on sets

The set

is a well-defined collection of objects.
Each object of a set is called a member or an element of the set.

- A pair of braces { } is used to designate a set with the elements listed or written inside the braces
- Capital letters are used to designate sets.
- Small letters may name elements of sets.
- The elements are written without repeating and the order of elements not important.

ex The set of digits of the number 56647 is A = { 5 , 6 , 4 , 7 }

Types of sets

A null set or an empty set

A set containing no elements and is denoted by the symbol " Ø " or { }.

ex {Cats that can fly} = { } = Ø

A Finite set

A set that contains a countable number of elements.

ex {Letters in the word "Good"} = {G, o, d}

An infinite set.

A set that contains an uncountable number of elements.

ex { Whole numbers } = {1, 2, 3, ...}

Equal sets are sets which contain exactly the same elements.

ex: {4, 2, 3} and {3, 4, 2} are equal sets.

Equivalent sets are sets which contain the same number of elements.

ex: {1, 2, 3, 4} and {1, 3, 5, 7} are equivalent sets.

The symbol " $\in$ " is used to denote that an object is an element of the set.

ex: $4 \in \{2, 4, 6\}$

The symbol " $\notin$ " indicates that an object is not an element of the set.

ex: $5 \notin \{2, 4, 6\}$

The universal set containing all the elements that can be used in a question is called the universal set. It is written as **U**.

The symbol " $\subset$ " is used to denote that a set is a subset of another set.

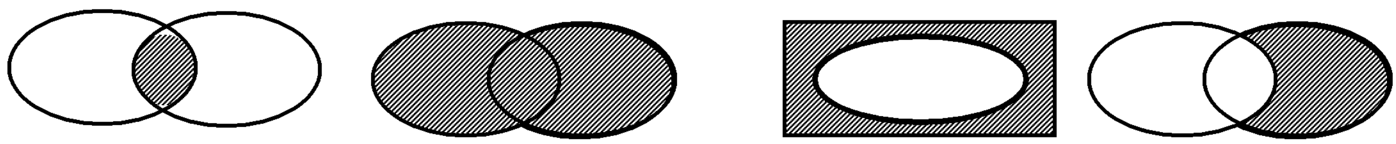
ex: $\{2, 4\} \subset \{2, 4, 6\}$

The symbol " $\not\subset$ " is used to denote that a set is not a subset of another set

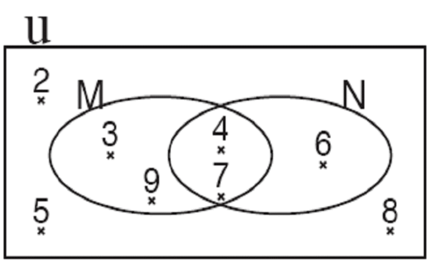
ex: $\{2, 4\} \not\subset \{2, 4, 6\}$

Operations on sets

Intersection ($\cap$)	Union ($\cup$)	complement ($'$)	difference (-)



In the Venn diagram, u is the universal set.



U = ...

M = ...

N = ...

M \ = ...

N \ = ...

M U N = ... M ∩ N =...................................

M – N = ... N – M = ...

Complete using (∈, ∉ , ⊂ , ⊄)

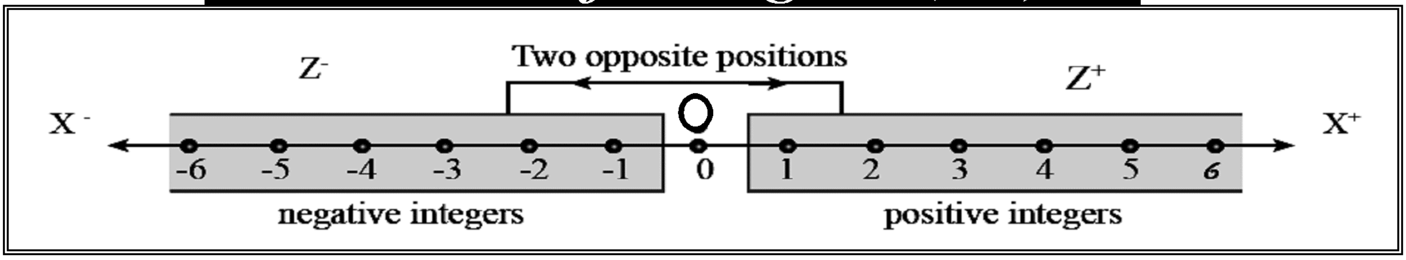
5	......	M	3	......	M	7	......	M
8	......	N	6	......	N	7	......	N
{ 2 , 5 }	......	M	{ 3 , 4 }	......	M	{ 2 , 3 }	......	M
{ 3 , 5 }	......	N	{ 4 , 7 }	......	N	{ 6 , 8 }	......	N
N	......	N	M	......	N	U	......	N
M	......	M	N	......	M	U	......	M
U	......	U	N	......	U	M	......	U

Complete using (∈, ∉ , ⊂ , ⊄)

5	....	{ 5 , 4 }	{ 5 , 4 }	......	{ 5 , 4 }	{ 1 , 2 }	......	{ 1 , 2 }
4	....	{ 54 }	{ 3 , 7 }	......	{ 6 ,4 }	{ 2 , 3 }	......	{ 1,2,3 }
9	....	{ 4 , 5 , 9 }	{ }	......	{ 65,45 }	{ 2 }	......	{ 2 , 3 , 4 }
7	....	{ 37 , 73 }	Ø	......	{ 6 , 2 }	2	......	{ 2 , 3 , 4 }
2	....	{ 22 , 32 }	{ 1 , 2 }	......	{ 12 , 21 }	12	......	{ 1 , 2 }
0	....	{ 10,50,20 }	{ 2 , 4 }	......	{ 2 , 3 , 4 }	12	......	{ 12 , 21 }
1	....	{ 1 , 2 , 3 }	{ 2 , 3 , 4 }	......	{ 2 , 4 }	0	......	{ }

Lesson 2

The Set of Integers (Z)



The set of integers is an infinite set and extends without limit from both sides

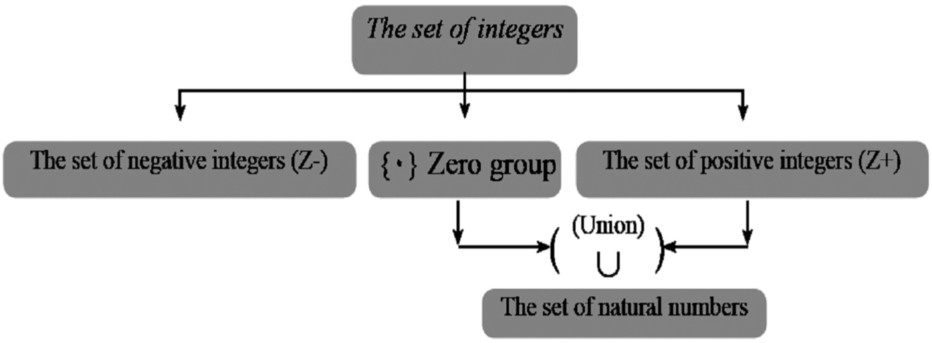
Zero is neither positive nor negative .

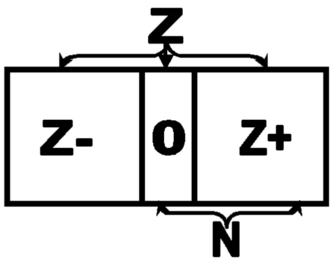
N ⊂ Z , Z^+ ⊂ Z , Z^- ⊂ Z , { 0 } ⊂ Z

The Set Positive Integers : $Z^+ = \{ 1 , 2 , 3 , 4 , 5 , . . . \}$

The Set Negative Integers : $Z^- = \{ -1 , -2 , -3 , -4 , -5 , . . . \}$

The Set of Integers Z = { . . . , -3 , -2 , -1 , 0 , 1 , 2 , 3 , . . . }

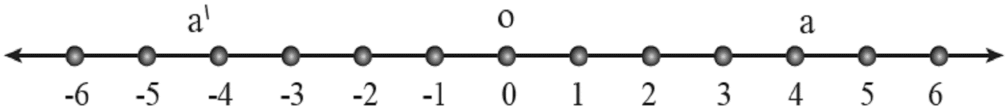




The absolute value of the integer

The absolute value of the integer (a) is the distance between the location of (a) and the location of Zero on the number line .

It is always positive and denoted by the symbol | a |



Each number and its inverse on the number line have the same absolute value because they are equidistant from the point of Zero (o).

ex

Find the absolute value of : 4 , -4 , 8 , -8

the solution : | 4 | = 4 , |-4| = 4 , | 8 | = 8 , |-8| = 8

Write an integer to express each situation of the following :

1- Hany gained LE 76 from his saving account. (…………………)

2- The temperature of Moscow City is 8 degrees below Zero. (…………………)

3- Building a public garage consists four floors underground in Cairo downtown. (…………………)

4- Paris rises 6 metres above sea level. (…………………)

5- Ahmed withdrew 6000 pounds from his bank account. (…………………)

6- The school added 10 marks for the student (Sarah), for her excellence in artistic activity. (…………………)

Complete the following

(a) $|-102| =$ ……

(b) $-|-15| =$ ……..

(c) $|-5| + |7| =$ ……

(d) the relation between $|b|$, $|-b|$ is …..

Express each of the following sets using the listing method;

(a) The set of integers which are less than 3. A = {…………………………………}.

(b) The set of integers which are greater than -2. B = {…………………………………}.

(c) The set of integers which are less than -5. C = {…………………………………}.

(d) The set of integers which are less than 6 and greater than -2. D = {…………………………………}.

(e) The set of integers between -4 and 3. E = {…………………………………}.

(f) The set of non - positive even integers. F = {…………………………………}.

Complete the following using one of the words (positive - negative - Zero) :

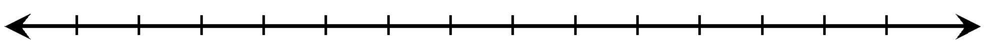
(a) Moving forward is represented by ……………………… numbers, while. moving backward is represented by …………………………. numbers.

(b) Moving to the right is represented by ……………………… numbers, while moving to the left is represented by ……………………… numbers.

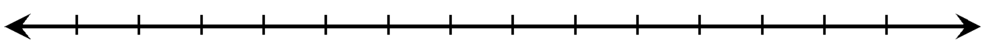
(c) Lowering than sea level is represented by ……………………… numbers, Height above sea level is represented by ……………………… numbers. Sea level is represented by the number ……………………….

Represent the following numbers on the number line using one of the symbols (x) or (•):

6



-3



Write the inverse of each of the numbers :

113 (………………) -9 (………………)

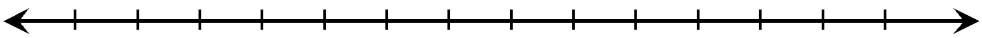
0 (………………) 7 (………………).

On the number line, colour each number of the following and its inverse :

(a) 5



(b) -4



Determine the value of the integer (b) in the following cases:

a) $|b| = 7$ then ………………………………………………………

b) $|b| = 16$ then ………………………………………………………

c) $|-9| = b$ then ………………………………………………………

Find the value of x to get a true statement :

(a) $-5 \in \{-1, 0, -3, x\}$ then ……………………………

(b) $x \in \{2, 5, -3\} \cap \{5, -2, -3\}$ then ……………………………

(c) $\{2, x\} \cup \{-4, 0, 4\} = \{0, -2, 2, -4, 4\}$ then ……………………………

Mark (true) or (false) and give the reason :

(a) Zero $\in Z^-$ ( ) because :

……………………………………………………………………

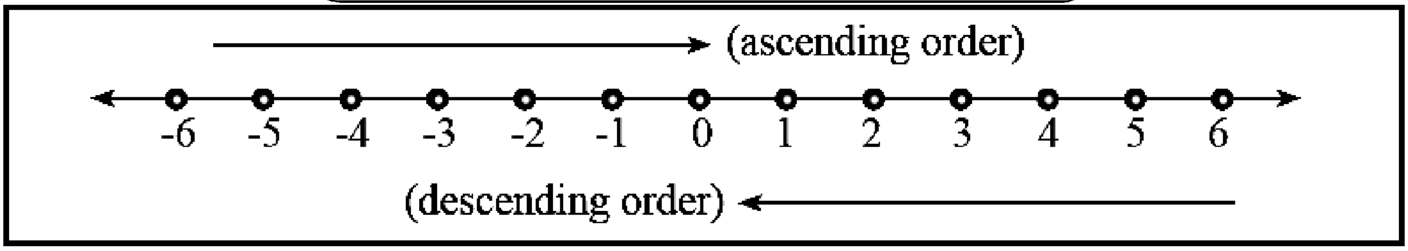
(b) $\varphi = Z^- \cap Z^+$ ( ) because : ……………………………………………………………

(c) $Z^+ \cap N = Z^+$ ( ) because : ……………………………………………………………

(d) $\{-17\} \subset Z$ ( ) because : ……………………………………………………………

Lesson 3

Ordering and Comparing Integers



This means that :

.... -3 < -2 < -1 < 0 < 1 < 2 < 3 < ... (ascending order).

.... 3 > 2 > 1 > 0 > -1 > -2 > -3 ... (descending order).

ex **Arrange the following numbers in an ascending order :**

-1 , 3 , 1 , -5 , 7

The ascending order is : -5 , -1 , 1 , 3 , 7

ex **Put the correct sign (>, < or =) :**

(a) -7 **>** -9 (b) 3 **>** -13 (c) -4 **<** 0

(d) | -11 | **=** 11 (e) -7 **<** - | -5 | (f) 30 **<** 103

Arrange the following integers :

(a) 6 , -60 , 2 , -17 , -22 , 0 (ascendingly).

...... , ... , ... , ... , ... , ...

(b) 1, -11, 3, -1, -8, 5 (descendingly).

...... , ... , ... , ... , ... , ...

Complete the space using the correct sign (>, < or =) :

(a) 3 .... -6 (b) -7 ... 17 (c) | -13 | 3

(d) | -5 | ..... 5 (e) 3 + | -3 | .... 8 (f) - | -4 | 2

Write the previous integer and the next integer for each of the following integers :

(1) (....) , -9 (....) (b) (....) , 13,(....) (c) (....) , 3 (....)

Write the integers between each two integers of the following:

(a) -4, (.......), 2 (b) -1, (.......), 5 (c) -7, (.......), 0

Determine the Constant value by which the following integers increase, then complete the next three numbers :

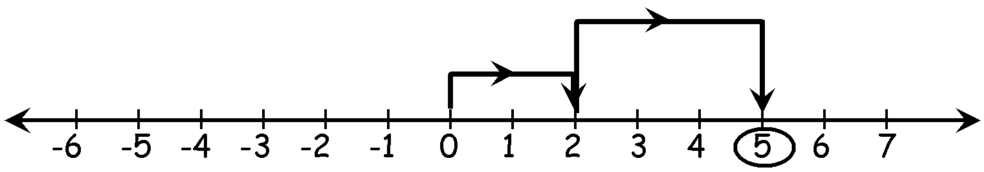
(a) -7, -6, -5, ..., ..., ...

(b) -50, -40, -30, ..., ..., ...

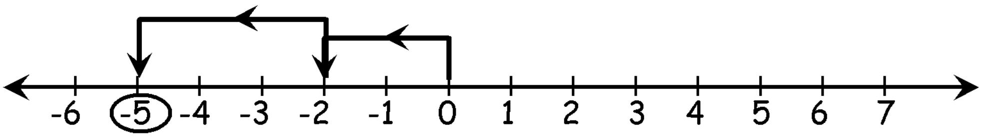
Lesson 4

Adding and subtracting Integers

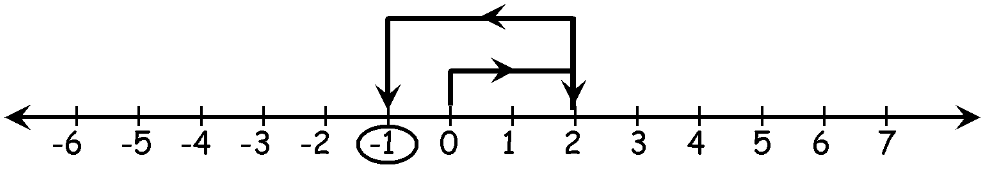
$2 + 3 = 5$



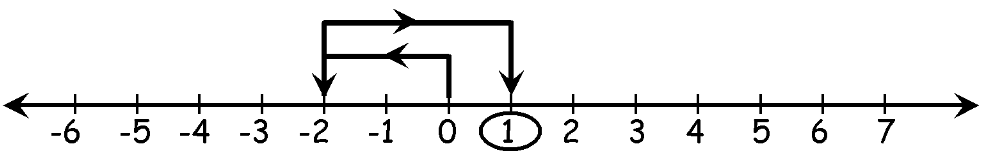
$(-2) + (-3) = (-5)$



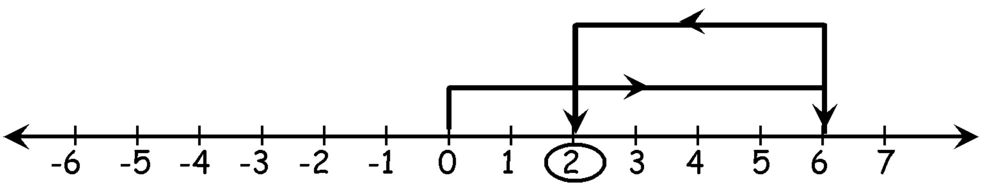
$2 + (-3) = (-1)$



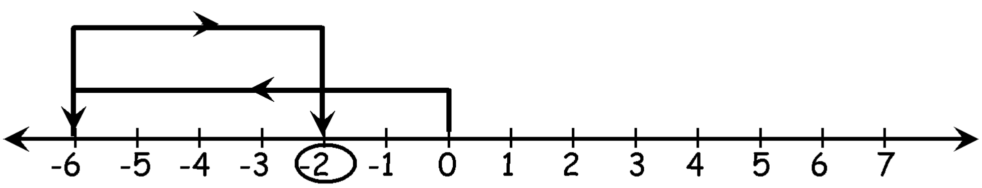
$(-2) + 3 = 1$



$6 + (-4) = 2$



$(-6) + 4 = (-2)$



i.e.

Adding positive integers and adding natural numbers are the same.
Adding two negative integers = negative integer
The sum of two different integers = positive or negative integer.

Properties of addition operation in Z :

1- <u>Closure property</u> : Z is closed under the addition operation, this means that the sum of any two integers is an integer.

If $a \in Z$, $b \in Z$ Then $a + b = c \in Z$

ex

This means that : the addition operation is always possible in Z

$3 \in Z$, $8 \in Z$ $3 + 5 = 8 \in Z$

$-3 \in Z$, $-8 \in Z$ $(-3) + (-5) = -8 \in Z$

$-3 \in Z$, $8 \in Z$ $(-3) + 5 = 2 \in Z$

2 - <u>Commutative property</u> :

The sum of any two integers doesn't change when commutating their positions.

If a, b are two integers, then : $a + b = b + a$

ex

$\because$ $3 + 5 = 8$ & $5 + 3 = 8$ $\therefore$ $3 + 5 = 5 + 3 = 8$

$\because$ $(-5)+(-3) =(-8)$ & $(-3)+(-5) =(-8)$ $\therefore$ $(-5)+(-3)=(-3)+(-5) =(-8)$

$\because$ $(-5)+3 =(-2)$ & $3 +(-5) =(-2)$ $\therefore$ $(-5)+3 = 3 +(-5) =(-2)$

<u>3- The additive - identity :</u>

Zero is the additive identity (neutral) in Z as It was in N.

If a is an integer, then : $a + 0 = 0 + a = a$

ex

$\because$ $3 + 0 = 3$ & $0 + 3 = 3$ $\therefore$ $3 + 0 = 0 + 3 = 3$

$\because$ $0 + (-3) = (-3)$ & $(-3)+ 0 =(-3)$ $\therefore$ $0+(-3)=(-3)+0 =(-3)$

<u>4- The additive - inverse :</u>

for each positive integer (a) on the number line,
there is an opposite negative integer (-a), where their sum = 0.

$a + (-a) = (-a) + a = 0$

ex

$\because$ $3 + (-3) = 0$ & $(-3) + 3 = 0$ $\therefore$ $3 + (-3) = (-3) + 3 = 0$

<u>5- Associative property :</u>

The addition operation is associative in Z as it was in N.

This means : If a, b, c are integers
Then : $a + b + c = (a + b) + c = a + (b + c)$

ex

Use the properties of addition operation in Z to find the result of (-17 , + 19 , + 17) State the property used in each step.

$-17 + 19 + 17$

$= -17 + (19 + 17)$	(Associative)
$= -17 + (17 + 19)$	(Commutative)
$= (-17 + 17) + 19$	(Associative)
$= 0 + 19$	(Additive inverse)
$= 19$	(additive identity)

subtracting two integers

If $a \in Z$, $b \in Z$ Then
$a - b = a +$ the additive inverse of b.
i.e. $a - b = a + (-b)$.

ex

find the result of each of the following :

(a) $9 - 5$ (b) $-7 - 4$ (c) $6 - 11$

The Solution :

(a) $9 - 5 = 9 + (-5) = 4$

(b) $-7 - 4 = -7 + (-4) = -11$

(c) $6 - 11 = 6 + (-11) = -5$

Properties of subtraction operation in Z :

from the above mentioned, we deduce that the properties of subtraction operation are :

1- **Closure property** : Z is closed under the subtraction operation This means that the difference between any two integers is an integer.

Therefore : the subtraction operation is always possible in Z.

2- **Commutative property**: the subtraction operation in Z is not Commutative:

$a - b \neq b - a$ for every a, b Z.

(From example (5) : (a) where $5 - 8 \neq 8 - 5$)

3- **Associative property**: The subtraction operation in Z is not associative :

$a - (b - c) \neq (a - b) - c$

(From example. (5) : (b) where $-9 - (3 - 8) \neq (-9 - 3) - 8$)

1- **Use the number line to represent the following operations of addition and subtraction :**

(a) -3 - 3 = ……



(b) -5 + 7 = ……



(c) 2 - (-3) = ……



2- Write the integers representing in each of the following :

(a) x < -1 ……………………………………………………………………………………

(b) x > 7 ……………………………………………………………………………………

(c) -4 < x < 4 ……………………………………………………………………………………

3- Complete using the suitable sign ($\in$, $\notin$, $\subset$, $\not\subset$):

(a) |-9 | + 3 …… Z

(b) {9} …… Z

(c) {-3, 7, 11} …… Z

(d) $\dfrac{9}{(7+7)}$ ….. Z

(e) $\dfrac{(6-6)}{8}$ …… Z

(f) $\dfrac{3}{5}$ …… Z

4- Use the properties of addition operation in Z to find the result of the following :

(a) -120 + 17 + 131

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

(b) 2015 + 180 + (-1015)

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

……………………………………………………………………………………

5- Check the property of closure of the addition and subtraction on the following sets of numbers :

X = {-1, 0, 1} , Y = {-2, -1, 0, 1, 2}

………………………………………………………………	………………………………………………………………
………………………………………………………………	………………………………………………………………
………………………………………………………………	………………………………………………………………
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6- Ramy deposited a sum of money amounting to LE 6220, then he withdrew an amount of LE 1211, and then deposited an another amount of LE 2110. How much is the balance of Ramy in the bank?

………

………

7- A Submarine at a depth of 90 metres below sea level, rose 60 metres. Use the appropriate calculation to calculate the new depth of the submarine.

………

………

8- Temperature is recorded in st. Catherine -3 °c at three o'clock after midnight, while it is recorded 11°c in the afternoon. calculate the increase in temperature

………

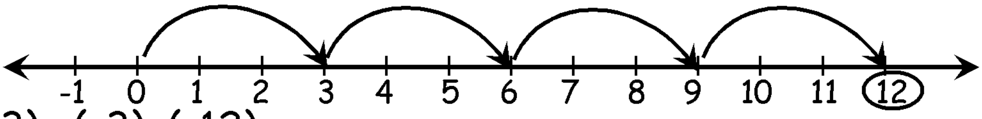
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Lesson 5

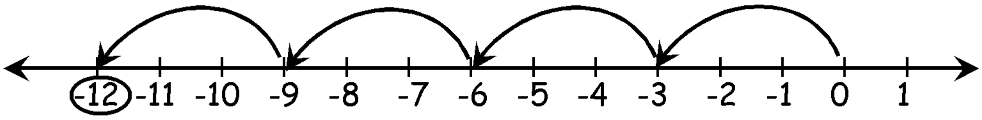
Multiplying and dividing integers

Multiplying Integers :

3 X 4 = 3+3+3+3 =12



(-3) X 4 = (-3)+ (-3)+ (-3)+ (-3)=(-12)



The product of two positive integers = positive integer.
The product of two negative integers = positive integer
The product of two integers having different signs = negative integer

⊕ x ⊕ = ⊕ ⊖ x ⊖ = ⊕ ⊖ x ⊕ = ⊖ ⊕ x ⊖ = ⊖

ex

find the result of each of the following :

(a) 5 X 6 = 30 (b) (-5) X (-6) = 30

(c) (-5) X 6 = - 30 (d) -5 X (-6) = -30

Properties of multiplication operation on Z :

1- Closure property : Z is closed under multiplication operation,
this means that the product of any two integers is an integer.
i.e. the multiplication operation is always possible in Z.

If a ∈ Z , b ∈ Z Then a X b = c ∈ Z

ex

This means that : the addition operation is always possible in Z

3 ∈ Z , 8 ∈ Z 3 X 5 = 15 ∈ Z

-3 ∈ Z , -8 ∈ Z (-3) X (-5) = 15 ∈ Z

-3 ∈ Z , 8 ∈ Z (-3) X 5 = -15 ∈ Z

2- Commutative property : The multiplication operation is commutative in Z.

If a ∈ Z , b ∈ Z Then a x b = b x a

ex

∵ 3 X 5 =15 & 5 X 3 =15 ∴ 3 X 5 = 5 +X 3 = 15

∵ (-5)X(-3) =15 & (-3)X(-5) =15 ∴ (-5)X(-3)=(-3)X(-5)=15

∵ (-5)X3 =(-15) & 3 X(-5) =(-15) ∴ (-5)X3 =3 X(-5) =(-15)

3- The multiplicative identity :

one is the multiplicative identity (neutral) in Z as It was in N.

If $a \in Z$, then $a \times 1 = 1 \times a = a$.

ex

$\because$ 3 X 1 = 3 & 1 X 3 = 3 $\quad\therefore$ 3 X 1 = 1 X 3 = 3

$\because$ 1 X (-3) = (-3) & (-3) X 1 = (-3) $\quad\therefore$ 1 X (-3) = (-3) X 1 = (-3)

4- Associative property :

the multiplication operation is associative in Z as it was in N.

$a \times b \times c = (a \times b) \times c = a \times (b \times c)$

ex

(-6 x 8) x -5 = -48 x -5 = 240

-6 x (8 x -5) = -6 x -40 = 240

i.e. -6 x 8 x -5 = -6 x (8 x -5) = (-6 x 8) x -5 = 240

5- The distribution :

It means distributing multiplication operation over addition operation.

If $a, b, c \in Z$, then : $a \times (b + c) = a \times b + a \times c$

ex

5 x (-3 + 7)	5 x -3 + 5 x 7
= 5 x 4	= -15 + 35
= 20	= 20

i.e. 5 x (-3 + 7) = 5 x -3 + 5 x 7 = 20

Dividing Integers :

If 7 x 5 = 35 , then : 35 ÷ 7 = 5 , 35 ÷ 5 = 7

This means that:

Multiplication operation produces two division operations.

the quotient of two integers of the same signs is a positive integer.
the quotient of two integers having different signs is a negative integer.

⊕ ÷ ⊕ = ⊕   ⊖ ÷ ⊖ = ⊕   ⊖ ÷ ⊕ = ⊖   ⊕ ÷ ⊖ = ⊖

Properties of division operation in Z :

1- Closure property : Z is not closed under division operation.

i.e. the division operation is not always possible in Z.

2- Commutative property : The division operation is not commutative in Z.

$$\frac{8}{3} , \frac{35}{9} , -22 \div 5 , \frac{-6}{-11} \notin Z$$

> *In the set of integers ,Remember that:*
>
> *The addition operation is always possible ,closed ,commutative and associative.
>
> *The subtraction operation is always possible ,closed ,not commutative and not associative.
>
> * The multiplication operation is always possible, closed, commutative and associative.
>
> * The division operation is not always possible, not closed, not commutative and not associative.

The property	Addition	Subtraction	Multiplication	Division
Always possible	√	√	√	x
Closure	√	√	√	x
Commutative	√	x	√	x
Associative	√	x	√	x
Identity	Additive-Identity " 0 "	x	multiplicative-Identity " 1 "	x
Inverse	Additive- Inverse Of "a" is "-a"	x	multiplicative - Inverse Of "a" is "$\frac{1}{a}$"	x
Distribution	X	X	a (b + c) = a X b + a X c	x

1- Find the result of each of the following :

(a) (-131) x (-3) = ………… (b) 5 x -4 = …………

(c) -8 x 1 = ………… (d) -9 (7) = …………

(e) 0 x (-11) = ………… (f) – (-6) x (-2) = …………

2- Determine the possible division operation in Z of each of the following :

(a) (-32) ÷ 8 = ………… …………………… (b) 65 ÷ (-13) = ………… ……………………

(c) 420 ÷ (-15) = ………… …………………… (d) (-1300) ÷ 26= ………… ……………………

3- Find the result of each of the following in two ways :

(a) $(-4) \times [4 + (-1)]$

(b) $[5 + (-3)] \times (-11)$

(c) $6 \times (-6 + 0)$

4- If $x = 3$, $y = -1$, $z = -7$; find the value of each of the following :

(a) $2x + y - z$ (b) $3xy - z$ (c) $(x \div y) \times 3Z$

5- Find the value of x if :

(a) $8 \times x = -48$

(b) $x \times 9 = -45$

(c) $x \times (5 \times -13) = (-9 \times 5) \times -13$

Lesson 6

Repeated multiplication

Multiplying the number by itself number of times.

Generally

If a is an integer number, then :

a X a X a X a X …….. n times = a^n where n $\in Z^+$

Power

$3 \times 3 \times 3 \times 3 = 3^4$ is read as

Base

THREE to the power of ***FOUR***
(3 is raised to the power 4)

The basic laws of repeated multiplication :

First : the law of adding powers :

If a $\in$ Z , a ≠ 0 then : $a^m \times a^n = a^{m+n}$ where m, n $\in Z^+$

ex $(2 \times 2) \times (2 \times 2 \times 2 \times 2 \times 2) = 2^2 \times 2^5 = 2^{2+5} = 2^7$

Second : the law of subtracting powers :

If a $\in$ Z , a ≠ 0 then : $\frac{a^m}{a^n} = a^{m-n}$ where m , n $\in$ Z+ , m > n

ex $3^5 \div 3^3 = 3 = \frac{3 \times 3 \times 3 \times 3 \times 3}{3 \times 3 \times 3}$ $3 \times 3 = 3^2$

$= \frac{3^5}{3^3} = 3^{5-3} = 3^2$

Nots

(1) The second power of any number :

is called the square of the number,

for example : 8^2 is read as (8 to the power 2)

or the square of 8.

(2) The third power of any number :

is called the cube of the number,

for example : 7^3 is read as (7 to the power 3)

or the cube of 7.

(3) The first power of any number = the number

and isn't written, for example : 3^1 , 5^1 are 3 , 5.

(4) If the base is a negative number raised to an even power:

then the result is a positive number.

For example : $(-3)^2 = -3 \times -3 = 9$

(5) If the base is a negative number raised to an odd power:

then the result is a negative number.

For example : $(-3)^3 = -3 \times -3 \times -3 = -27$

(6) for every **a $\in$ Z , a ≠ 0 , then : $a^0 = 1$**

for example : $5^0 = 1$, $(-17)^0 = 1$, $(19)^0 = 1$, $(-256)^0 = 1$

(7) If the bases are different [3, (-3)] Try to get equal bases

For example :

$$\frac{3^4 \times (-3^5)}{3^7} = \frac{3^4 \times -(3)^5}{3^7} = \frac{-(3^4 \times 3^5)}{3^7} = \frac{3^4 \times -(3)^5}{3^7} = -(3)^{9-7} = -(3)^2 = -9$$

If a $\in$ Z , a ≠ 0 then : $(-a)^n = (a)^n$ if n is even number

$(-a)^n = -(a)^n$ if n is odd number

1- Find the value of each of the following :

(a) $(-7)^2$ = ...
(b) $(-5)^2 \times 2^2$ = ...
(c) $(-2)^4 + (-3)^3$ = ...
(d) $(-1)^{100} + (-1)^{101}$ = ...
(e) $(-4)^3 \times (-1)^5$ = ...
(f) $2^3 + 2^2$ = ...

2- Find the result of each of the following :

(a) $3^7 \div 3^4$ = ...
(b) $(-6)^5 \div (-6)^3$ = ...
(c) $(-5)^5 \div 5^3$ = ...

3 -Arrange in an ascending order:

3^2 , $(-1)^{15}$, $(-4)^0$, $(-3)^2$, $(-2)^5$

.... , ... , ... , ... , ...

4- Find the result of each case of the following :

(a) $\frac{2^5 \times 2^6}{2^3 \times 2}$ ....

....

(b) $\frac{(-3)^3 \times (-3)^4}{(-3)^5}$ ....

....

(c) $\frac{(-8)^3 \times 8^4}{(-8)^5}$ ....

....

(d) $\frac{9^6 \times (-9)^6}{(-9)^5 \times 9^2}$ ....

....

5- If a = 2 , b = -3, find the value of the following :

(a) $3a^2$

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(b) $2a + 3b$

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(c) $a^2 + b^2 + ab$

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6- Arrange in a descending order :

$$10^2 , (-1)^5 , 100^2 , (-10)^3 , 1000000$$

.... , ... , ... , ... , ...

7- Put the suitable sign (> , < or =) :

(a) 4^2 8

(b) $(-6)^2$ .... - 12

(c) $(9)^2$ .... $(-3)^4$

(d) $\frac{1}{7^5} \times 7^5$ 1

Lesson 7

Numerical patterns

is a sequence of numbers according to a particular rule.

N = {0, 1, 2, 3, 4, 5, ...}

Natural numbers (N) represents a sequence of numbers according to a particular rule which is :

((Each number is more than its predecessor by one))

The set of odd numbers = {1, 3, 5, 7, ...}
The set of even numbers = {0, 2, 4, 6, ...}

both are also a sequence of numbers according to the rule:

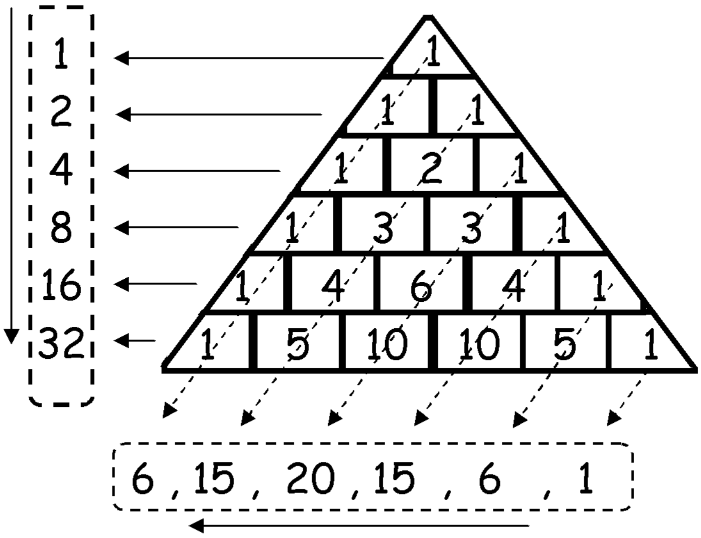
((Each number is more than its predecessor by 2))

Pascal's triangle

In the Pascal's triangle figure,
the pattern of each of :

(a) The sum of numbers of the rows
1 , 2 , 4 , 8 , 16 , 32 , ...

(b) the diagonals
1 , 6 , 15 , 20 , 15 , 6 , ...



Describing of the pattern : Means discovering the rule of the pattern and expressing it in words.

ex

The numerical pattern	*Description of the pattern*
1 , 4 , 7 , 10 , 13 , ...	each number is more than its predecessor by 3.
1 , 2 , 4 , 8 , 16 , ...	each number is twice of its predecessor.
256 , 128 , 64 , 32 , . . .	each number is half of its predecessor.
50 , 45 , 40 , 35 , 30 , . . .	each number is less than its predecessor by 5.

1- Complete the following table :

The numerical pattern	*Description of the pattern*
3 , 7 , 11 , 15 , 19 , 23 , ……	………………………………………………………
…………………………	Each number is more than its predecessor by 5.
……………… , $\frac{5}{4}$,1, $\frac{3}{4}$, $\frac{1}{2}$, $\frac{1}{4}$	………………………………………………………
…………………………	Each number is less than its predecessor by 4.
3 , 9 , 27 , 81 , ………..	………………………………………………………

2- Complete the following numerical patterns by writing three consecutive numbers :

(a) 6 , 14 , 22 , 30 , 38 , ………. , ………… , ……….

(b) $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, $\frac{1}{16}$, ……….. , ……… , ………..

(c) 2 , 3 , 5 , 8 , 13 , ………… , ………. , ……….

(d) 1 , 4 , 9 , 16 , 25 , ……….. , ………… , …………

3- Discover the rule of the numerical pattern and write the missing numbers in each case :

(a) 4 , 7 , ………… , 13 , 16 , ………. , …………

(b) 7 , ……… , 15 , 19 , 23 , ……….. , …………

(c) 0.5 , 1 , ……….. , 2 , 2.5 , ……… , ………….

(d) 128 , 64 , ………… , 16 , 8 , ………… , ………….

(e) ……….. , 15 , 12 , 9 , ………. , ………….

4- An Egyptian land company reclaims 6 feddans per day to become prepared and ready for agriculture. How many days do the company require to reclaim about 50 feedans? Write the numerical pattern which expresses this and describe it.

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Lesson 8

General exercise on unit one

1- Complete the following :

(a) the set of odd numbers U the set of even numbers = ……..

(b) Z = Z+ U ……….. U …………

(c) ………. Is the smallest positive number.

(d) Z = N U …………

(e) Z+ ∩ Z- = ………..

(f) -| -54 | = ……….

(g) Z- ……… N

(h) { 15 } ……… Z-

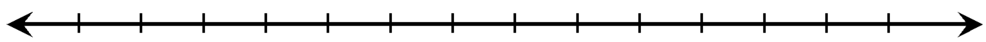
2- Arrange the following numbers descendingly :

-9 , 0 , 7 , -15

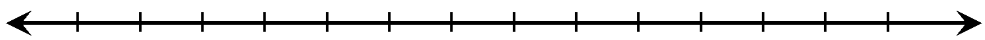
………… , ………… , ………… , …………

3- represent the following addition and subtraction operations on the number line :

(a) 9 - | -5 |



(b) 4 – 6



4- Use the properties of addition and subtraction in Z to find the result of the following :

(a) -5 + 8 – 15 = ………………………..

………………………..

………………………..

………………………..

(b) -1 + 4 + 41 = ………………………..

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5- One winter night, the TV announcer for the weather forecast referred to the temperature in Cairo 18°C and in Moscow -4°C.
Calculate the difference in temperature between Cairo and Moscow.

……………………….. ……………………….. ………………………..
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6- Find the result of the following :

(a) $(-36) \div (-4) =$ ……………………….. ………………………..

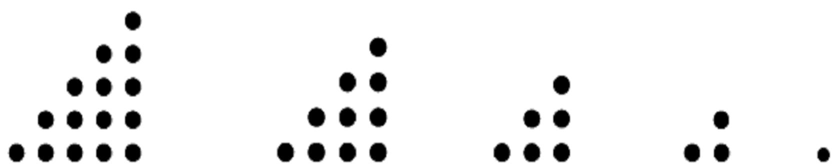
(b) $2^3 \times (-1)^2 \div 8 =$ ……………………….. ………………………..

(c) $(-4)^{11} \times \frac{(4)^5}{(4)^{12}}$ =……………………………………………………

7- Khaled decided to lose weight at the rate of 3kg monthly. If he is 90 kg heavy right now , then how many months does he need to reach 69kg ? Write the expressing numerical pattern and describe it.

……………………….. ……………………….. ………………………..
……………………….. ……………………….. ………………………..

8- Write the number of dots below each figure of the following



The number of dots : ……….. ……… ……… ……… ……..

The numerical pattern : ………………………………

The rule of the pattern : ………………………………

Unit 2

The equations
And
The inequalities

Lesson 1 The equation and Inequality of the first degree.

The equation : is a mathematical sentence includes equality relation between two sides

$x + 7 = 12$ is an equation, because it contains equality of two sides.

The inequality is a mathematical sentence including the sign of inequality between two sides.

$2x < 7$ is an inequality, because of the existence of the inequality sign between its two sides.

Degree of the equation

The degree of the equation is equal to the highest power of the unknown (symbol) in this equation.

For example :

$x + 5 = 7$ is an equation of the first degree in one unknown (x).

, $x^2 + 3 = 8$ is a second degree equation in one unknown (x).

, $4x^3 - x = 29$ is a third degree equation in one unknown (x).

Solution of the equation or the inequality

Example

Given that the substitution set is L = {0, 1, 2, 3}, find the solution set of :

(first) the equation $x + 3 = 5$ (second) the inequality $x + 3 < 5$

Solution

(first) the equation $x + 3 = 5$: At x = 0, $0 + 3 = 3 \neq 5$, so "zero" does not verify the equation.

At x = 1, $1 + 3 = 4 \neq 5$, so "1" does not verify the equation.

At x = 2, $2 + 3 = 5 = 5$ so "2" verifies the equation.

At x = 3, $3 + 3 = 6 \neq 5$, so "3" does not verify the equation.

We get the solution set = {2}. Notice that $\{2\} \subset \{0, 1, 2, 3\}$

(second) the inequality $x + 3 < 5$: At x = 0, $0 + 3 = 3 < 5$, so "zero" verifies the inequality.

At x = 1, $1 + 3 = 4 < 5$, so "1" verifies the inequality.

At x = 2, $2 + 3 = 5 \nless 5$ so "2" does not verify the inequality.

At x = 3, $3 + 3 = 6 \nless 5$, so "3" does not verify the inequality.

We get the solution set = {0,1}. Notice that $\{0,1\} \subset \{0, 1, 2, 3\}$

Find the solution set of each of the following equations and inequalities:

(1) $x + 5 = 12$, if the substitution set is $\{3, 5, 7, 8\}$.

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(2) $2(x - 3) = x + 1$, if the substitution set is $\{4, 5, 6, 7\}$.

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(3) $3x - 1 > -2$, if the substitution set is $\{-2, -1, 0, 1, 2\}$.

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(4) $-x + 1 < 4$, if the substitution set is $\{-3, -2, 0, 2, 3\}$.

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Lesson 2 Solving first degree equations in one unknown.

Example Solve the equation $x - 2 = 3$ in Z

Solution : $x - 2 = 3$ (by adding 2 to both sides).

$\therefore x - 2 + 2 = 3 + 2$

$\therefore x + 0 = 5$

$\therefore x = 5$, then the solution set = {5}.

or s.s. = {5} where s.s. means solution set.

Example : solve the equation $4x = 24$ in N.

Solution : $\frac{4x}{4} = \frac{24}{4}$ by dividing both sides by 4

$\therefore x = 6$ i. e s.s = {6}

Example : solve the equation : $2x + 9 = -23$ in N and Z

Solution:

$\because 2x + 9 = -23$ (by adding (-9) to both sides)

$\therefore 2x + 9 + (-9) = -23 + (-9)$

$\therefore 2x = -32$ (dividing both sides by 2)

$\therefore \frac{2x}{2} = \frac{-32}{2}$ i.e.

$x = -16 \notin N$, then the equation has no solution in N and the s.s. $= \varphi$

, $x = -16 \in Z$ i.e s.s = {-16}

(1) Find the solution set of each of the following equations in N :

(a) $4x + 1 = 17$.

(b) $2x = 3x + 21$.

(2) Find the solution set of each of the following equations Z :

(a) $3x - 2 = -19$.

(b) $(3x - 5) + 4 = x - 11$.

(3) Study the possibility of solving each of the following equations in N , Z :

(a) $3m + 12 = 6$.

(b) $2L - 15 = 8$.

Lesson 3 Applications on Solving First Degree Equations in N

Example: If 4 is added to a number, then the result is 14. What is this number?

Solution : let the number be x

$\therefore$ x + 4 = 14,

$\therefore$ x + 4 = 14 (subtract 4 from both sides)

$\therefore$ x + 4 - 4 = 14 - 4

$\therefore$ x + 0 = 10

$\therefore$ x = 10 , then the number is 10

Example : Three consecutive natural numbers, their sun is 27. find these numbers.

solution:

let the smaller number be x, then the following number is x + 1 and the following is x + 2

$\therefore$ The equation is the mathematical sentence:

$\therefore$ x + x + 1 + x + 2 = 27

$\therefore$ 3x + 3 = 27 (subtract 3 from both sides)

$\therefore$ 3x + 3 - 3 = 27 - 3

$\therefore$ 3x + 0 = 24

$\therefore$ 3x = 24 (dividing by 3)

$\therefore$ x = 8 i.e the smaller number is 8

i.e the three numbers are : 8, 9, 10

(1) If 9 is added to twice a number, the result is 55. find the number.

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(2) Two consecutive odd numbers, their sum is 16, find them.

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(3) Two integers one of them is twice the other and their sum is 54, find the two numbers.

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(4) If a man's age is three times his son's age and the sum of their ages is 72 years, what is the age of each of them?

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(5) If the number of the pupils of the sixth form in a school is 120 pupils and the number of girls is three times the number of boys, calculate the number of each of boys and girls.

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(6) The sum of the three dimensions of a cuboids is 18 cm. If the length of its base is three times its width and its height is twice its width, calculate the lengths of its dimensions.

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Lesson 4 Solving first Degree Inequality in one unknown

Example : Find the solution set of the inequality $2x + 9 < 1$ and represent it on the number line if

(1) $x \in N$ (2) $x \in Z$

Solution :

$2x + 9 < 7$ (subtracting 9)

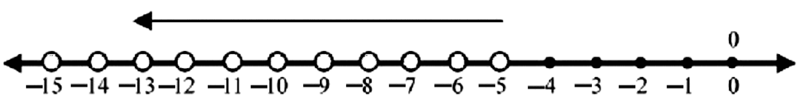
$\therefore 2x + 9 - 9 < 1 - 9$ i.e $2x < -8$ (dividing by 2)

$\therefore x < -4$ (not possible in N)

$\therefore$ s.s. $= \varphi$

(2) In Z $\because x < -4$ (possible in Z)

$\therefore$ s.s. $= \{-5, -6, -7, \ldots\}$



Example (3): Find the solution set of the inequality $-1 \le 2x + 3 < 13$ in Z, then represent it on the number line.

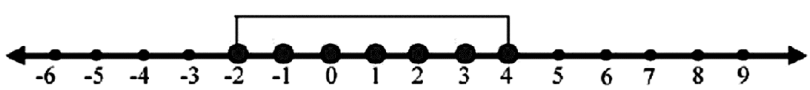
Solution : $\because -1 \le 2x + 3 < 13$ (subtracting 3)

$\therefore -1 - 3 \le 2x + 3 - 3 < 13 - 3$

$\therefore -4 \le 2x < 10$ (dividing by 2)

$\therefore -2 \le x < 5$

$\therefore$ s.s. $= \{-2, -1, 0, 1, 2, 3, 4\}$



Find the solution set each of the following inequalities represent the solution set on the number line :

(1) $2x - 5 \leq -7$, where $x \in Z$

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(2) $5x - 8 > 2x + 1$, where $x \in N$

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(3) $3 < 2x - 1 \leq 9$, where $x \in Z$

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Unit 3

Geometry And Measurement

Unit test

(1) In the opposite figure,

a- Dtermine the coordinates of the following points :

A (…… , …….) , B (…… , …….) and C (…… , …….)

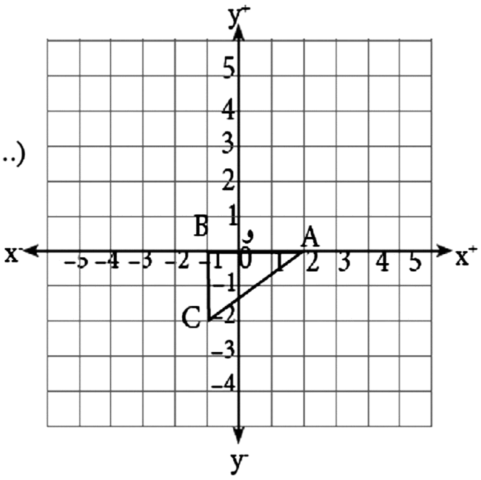
b- Find the image of the Δ ABC by translation

(x + 2 , y + 3).

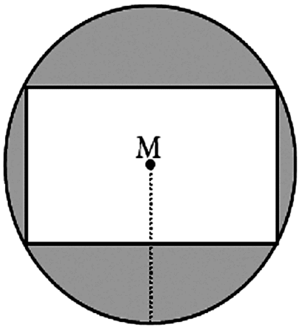
c- The length of $\overline{BC}$ = …………… .

The length of $\overline{AB}$ = …………….. .

d- Is the Δ ABC symmetric or not? Why?



(2) In the opposite figure, M is a circle of radius length 5 cm, a rectangle is drawn inside it its length is 8 cm and width is 4 cm. Calculate the area of the shaded part. ($\pi \approx \frac{22}{7}$ or 3.14)



(3) The sum of the edge lengths of a cube is 72 cm. Calculate its lateral area and total area.

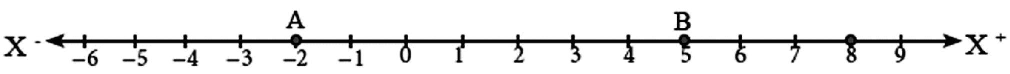
(4) A room in the form of cuboid its inner dimensions are :

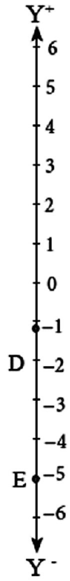
7m length, 5m width and 3.5m high. It is wanted to paint its lateral walls and the ceiling. The cost price of one square meter of paint is LE 11. Calculate the required cost.

Lesson 1 The distance between two points in the coordinate plane

the distance between two points on a straight line.

= | number of the ending point – number of the starting point |





From the opposite figure :

AB = | B – A | = | 5 – (-2) | = | 5 + 2 | = 7 units.

DC = | ……… | = | ………. | = | ……….| = …… units.

DE = …………. = …………. = ………….. units.

the distance between two points in the coordinate plane Z.

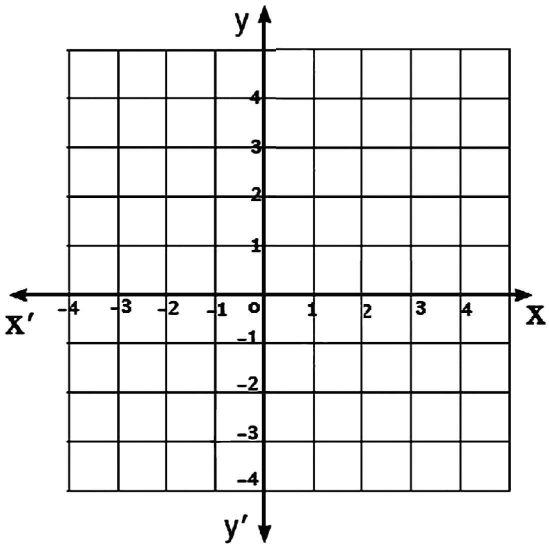
From opposite figure :

A (-2 , 1) , B (3 , 1) and D (-2 , 5)

$\overline{AB} \parallel \overleftrightarrow{X^- X^+}$

AB = | $B - A$ | = | 3 – (-2) | = 5 cm.

AD = ……….. = …………… = ……….



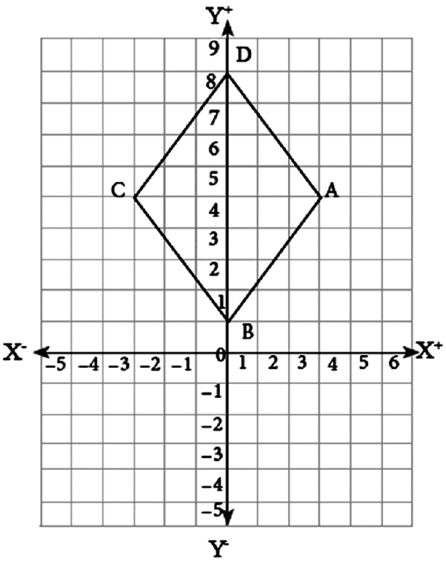
Determine the position of the point C (3 , 5) , then satisfy that the shape ABCD is a parallelogram, Calculate its perimeter and its area.

……………………………………………………………………………………

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(1) In the opposite coordinate plane : ABCD is a rhombus.



(a) Complete the coordinates of the following points :

A (……. , …….) , B (……. , …….)

C (……. , …….) , D (……. , …….)

(b) The area of the rhombus ABCD can be calculated by using the length of its perpendicular diagonals, where :

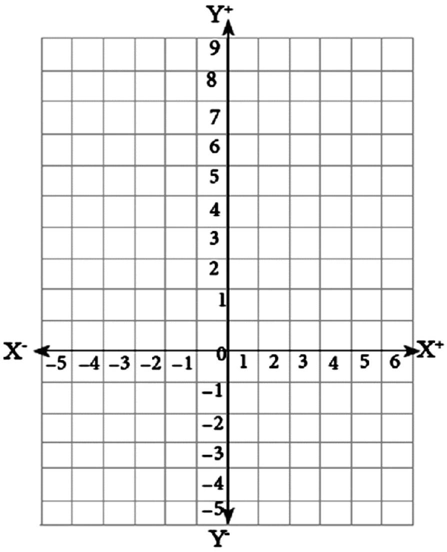
the length of $\overline{AC}$ = ……….. ,

the length of $\overline{BD}$ = …………

Surface area of the rhombus = …………..

---

(2) In the opposite coordinate plane :



(a) Determine the position of the following points

L (-1 , 1) , M (1 , 1)

N (1 , 8) , E (-1 , 8)

(b) Find the perimeter and the area of the shape LMNE.

……………………………………………………………

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(c) Determine whether the shape is symmetric or not ? Why?

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Lesson 2 The geometric transformations. Translation transformation

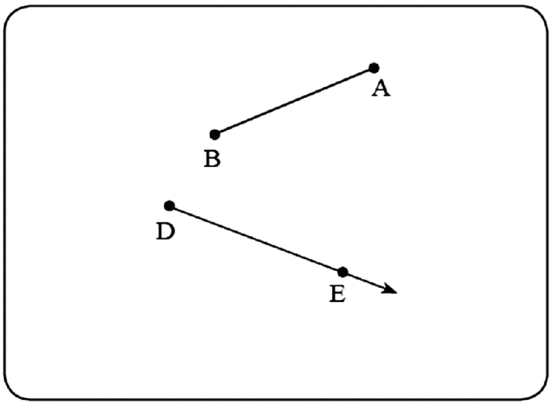
The geometric transformation transforms each point in the plane in to a point A′ in the same plane.Also

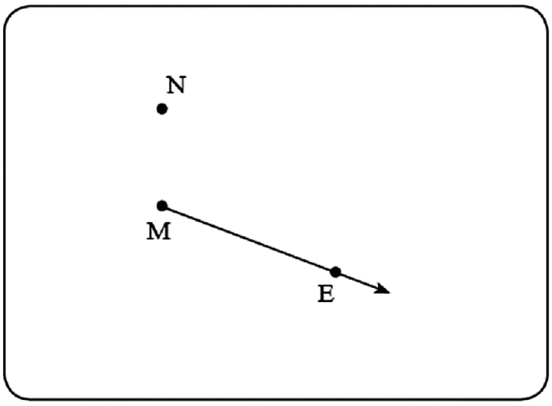
First : Translation of a point in the plane.

Find the following :

a) The image of the point N by translation $\overline{ME}$ in the direction of $\overrightarrow{ME}$.

b) The image of the $\overline{AB}$ by translation its magnitude is 3 cm in the direction of $\overrightarrow{DE}$.





Third : The translation of a geometric shape in the coordinate plane

Example

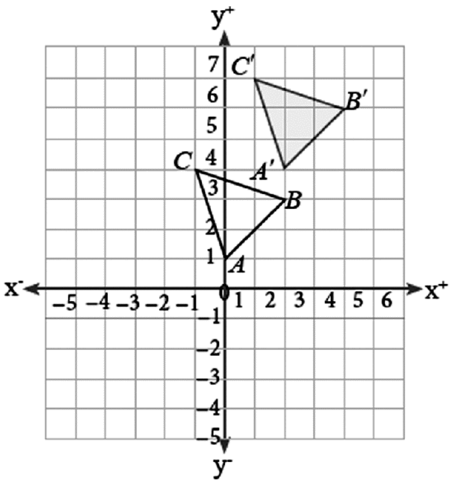
In the opposite figure, Find the image of the Δ ABC where : A (0 , 1) , B (2 , 3) and C (-1.4) by translation (X + 2 , y + 3).

Solution :

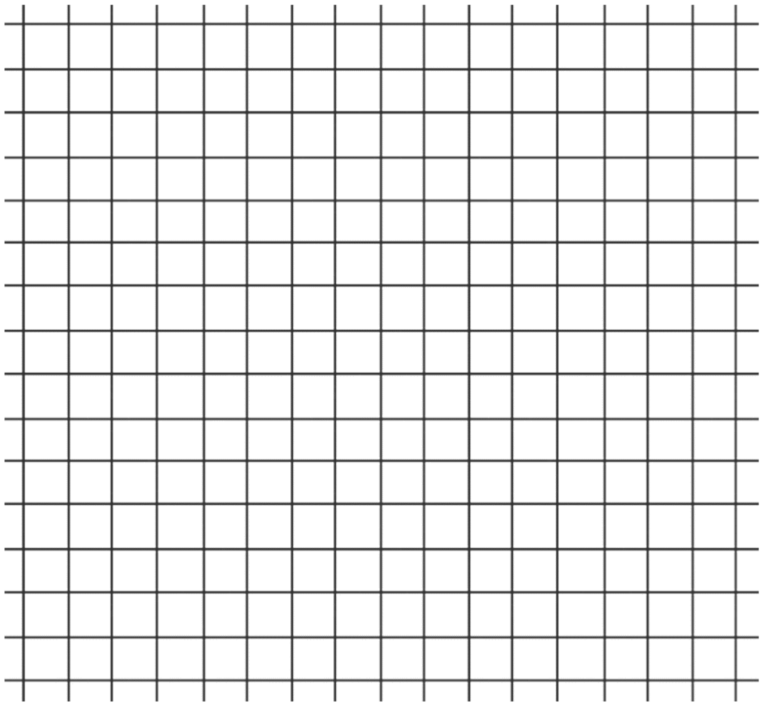
$A' = (0 + 2, \quad 1 + 3) = (2, 4)$

$B' = (2 + 2, \quad 3 + 3) = (4, 6)$

$C' = (-1 + 2, \quad 4 + 3) = (1, 7)$

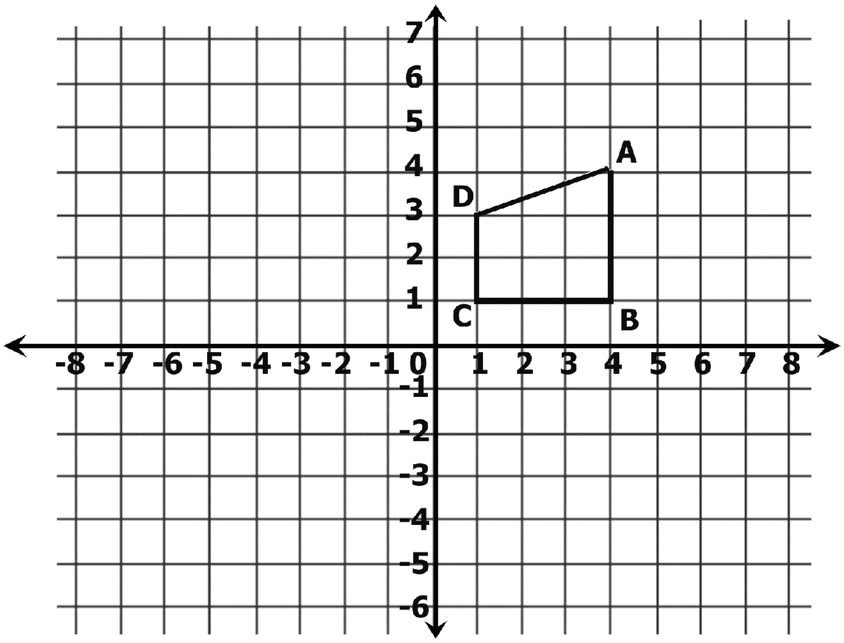


In the coordinate plane ABCD is a rectangle where :
A (4 , 1) , B (4 , 3) , C (1. 3) and D (1 , 1), Find its image by transl ion (x + 3 , y + 3).



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The image of the quadrilateral ABCD by translation (3 , -4).



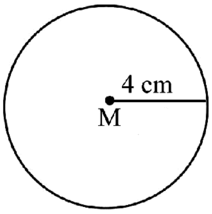
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Lesson 3 Area of the circle

The surface area of the circle = πr^2

Example (1) :

In the opposite figure, calculate the surface area of the circle M



Solution :

The surface area of the circle = πr^2

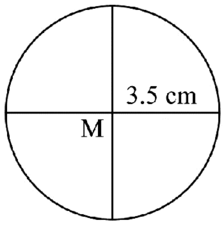
$= 3.14 \times 4 \times 4 = 50.24$ cm²

Notice that : π (as you studied before) is the approximately ratio between the circumference and the diameter of the circle it is $\approx \frac{22}{7}$ or 3.14 and r is the abbreviation of radius which represents its length.

You can use the calculator to carry out the approximation to find the required solution.

Example (2) :

A circle its diameter is 14 cm, calculate its surface area where $\pi \approx \frac{22}{7}$



Solution :

The surface area of the circle $\pi r^2 = \frac{22}{7} \times \frac{14}{2} \times \frac{14}{2} = 154$ cm²

Example (3) :

In the opposite figure, a circle M of radius 3.5 cm, is divided into four equal circular sectors. Calculate the surface area of one sector where $\pi \approx \frac{22}{7}$

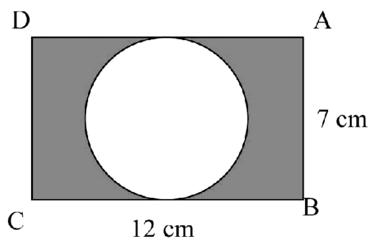
Solution :

The surface area of the circle = $\pi r^2 = \frac{22}{7} \times \frac{35}{10} \times \frac{35}{10} = 38.5$ cm²

The surface area of one sector = $\frac{38.5}{4} \approx 9.6$ cm²

Example (4) :

In the opposite figure, ABCD is a rectangle its length 12 cm, its width 7 cm . A circle is drawn to touch the sides $\overline{AD}$ and $\overline{BC}$. Calculate the area of the shaded part where ($\pi \approx \frac{22}{7}$)



Solution :

The area of the rectangle = 12 x 7 = 84 cm²

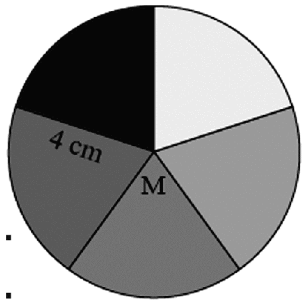
The area of the circle = $\pi r^2 = \frac{22}{7} \times \frac{7}{2} \times \frac{7}{2} = 35.5$ cm²

The area of the shaded part = 84 – 35.5 = 48.5 cm²

(1) A circle its diameter is 12 cm, calculate its surface area where $(\pi \approx \frac{22}{7}$ or $3.14)$

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(2) In the opposite figure, a circle M of radius 4 cm, is divided into five equal circular sectors. Calculate the surface area of one sector where $(\pi \approx \frac{22}{7}$ or $3.14)$

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(3)A circle its surface area is 314 cm^2. Calculate its circumference

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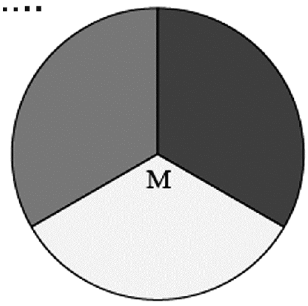
(4) A circle its circumference is 62.8 cm. Calculate its surface area. $(\pi \approx \frac{22}{7}$ or $3.14)$

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(5) In the opposite figure, a circle M is divided into three equal circular sectors, if the surface area one sector is 37.7 cm^2, then find its radius length where $(\pi \approx \frac{22}{7}$ or $3.14)$

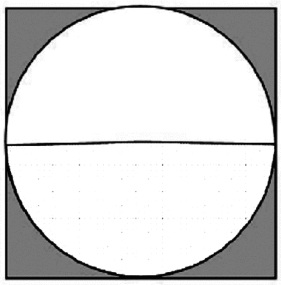
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(6) In the opposite figure, circle M is drawn inside the square of side length 10 cm to touch its sides.
Calculate the area of the shaded part where ($\pi \approx \frac{22}{7}$ or 3.14)



10 cm

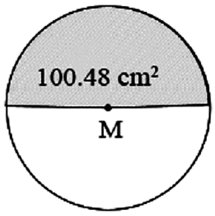
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(7) In the opposite figure, circle M its half of surface area is 100.48 cm^2. Calculate its circumference where ($\pi \approx \frac{22}{7}$ or 3.14)



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(8) A table its surface in the form of a circle, its diameter is 1.5 m. Its surface is wanted to be covered by sheet of glass equals to its surface. Calculate the cost price if the square meter of the glass costs LE 60. ($\pi \approx \frac{22}{7}$ or 3.14)



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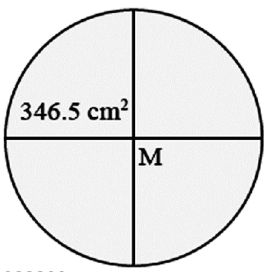
(9) A circle its circumference is 57 cm . Calculate its surface area.

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(10) In the opposite figure, a circle M is divided into four equal circular sectors, if the surface area of one sector is 346.5 cm^2, then calculate its circumference where ($\pi \approx \frac{22}{7}$ or 3.14)



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Lesson 4 The lateral area and the total area For each of cube and cuboid

The lateral area of the cube = Area of one face x 4

The lateral area of the cube = Perimeter of the base x height

The **total** area of the cube = Area of one face x 6

Example A cube of edge length 6 cm, Find its lateral area and its total area.

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The total area of a cube is 486 cm^2 . Find the area of one face and its lateral area.

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The sum of edge lengths of a cube is 84 cm . Find its lateral area and its total area.

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* The lateral area of the cuboid = Perimeter of the base x height
* The total area of the cuboid = The lateral area + Area of the two bases.

A cuboid its length is 6 cm, its width is 4 cm, and its height is 8 cm.

Find its lateral area and its total area.

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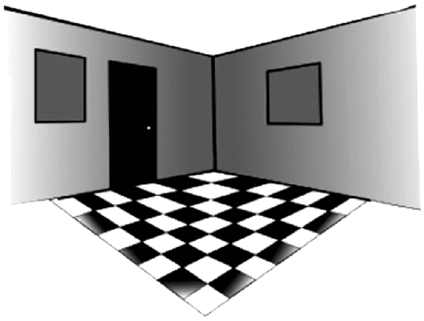
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A room in the form of cuboid its inner dimensions are : 5 m length, 3.5m width and 3 m hight. It is wanted to paint its lateral walls. The cost price of one square meter is LE 9. Calculate the required cost.



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(3) If the lateral area of a cube is 36 cm^2. Find its total area.

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(4) A cube of edge length 8 cm . Calculate the ratio between its lateral area and its total area.

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(5) The total area a cube is 726 cm^2 . Calculate its lateral area.

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(6) A cube of edge length 10 cm and a cuboid its length 8cm; its width 5 cm; its height 17 cm. Calculate the difference between their lateral area.

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(7) A box without a lid its length 16 cm; its width 7 cm; its height 19 cm. Calculate its lateral area and total area.

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(8) A box truck in the form of cuboid, its inner dimensions are 5 cm, 2.5m and 1.6 m.

It is wanted to paint the inner box with paint, the cost price of one square meter is LE 12. Calculate the cost of paint.



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(10) A room its length is 5m, its width is 4m, and its height is 3.2m. It is wanted to paint its lateral walls and ceiling. The cost price of one square meter is LE 8. Calculate the required cost. Knowing that the room has 2 windows and a door their areas are $8m^2$.

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(11) Youssef used a piece of cardboard in the form of rectangle, its length is 1.2m and its width is 80 cm to form a cubed box its edge length is 30 cm. Calculate the remained paper area after forming the box.

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(12) The inner dimensions of a swimming pool are 30m, 10m and 1.5 m . It is wanted to cover it with a tile of squared shape its side length is 20 cm. If the cost price of one square meter is LE 32. Calculate the cost of covering its wall and ground.

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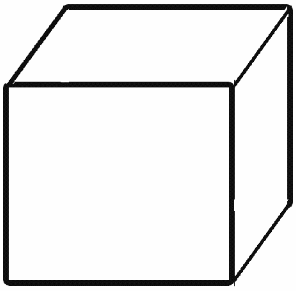
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(13) A box truck for carrying goods in the form cuboid, its inner dimensions are 4m, 2.5m and 1.8m. It is wanted to cover its side and ceiling with a sheet iron the cost price of square meter is LE 15. Calculate the cost of required sheet iron.

Lesson 4-A The lateral area and the total area For cube

The Cube has :

12 Edges
8 Vertices
6 Faces



Lateral Surface Area of the cube = Area of one face X 4
L . S . A. of the cube = Area of one face X 4
L . S . A. of the cube = edge X edge X 4
Area of one face = L. S. A. ÷ 4

Total Surface Area of the cube = Area of one face X 6
T. S. A. of the cube = Area of one face X 6
T. S. A. of the cube = edge X edge X 6
Area of one face = T. S. A. ÷ 6

L. S. A. : T. S. A.
Face area X 4 : Face area X 6
4 : 6 ÷ 2
2 : 3

The Length of one edge = Sum of edges ÷ 12

A cube of edge length 6 cm, Find its lateral area and its total area.

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The sum of edge lengths of a cube is 84 cm .

Find its lateral area and its total area.

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The total area of a cube is 486 cm^2 .

Find the area of one face and its lateral area.

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If the lateral area of a cube is 36 cm^2. Find its total area.

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A cube of edge length 8 cm . Calculate the ratio between its lateral area and its total area.

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The dimensions of a cuboid are 6 cm. long , 5 cm. wide and 8 cm. high.
The edge length of a cube is 7 cm.
Find the difference between their lateral areas.

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A box without a lid whose length is 16 cm., its width is 7 cm. and its height is 19 cm. Calculate its lateral area and total area.

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A cuboid base is a square of side length 32 cm. and its height is $\frac{3}{8}$ the side length of its base. Find its total area.

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Lesson 4-B The lateral area and the total area For cuboid

* The lateral area of the cuboid = Perimeter of the base x height
* The total area of the cuboid = The lateral area + Area of the two bases.

A cuboid its length is 6 cm, its width is 4 cm, and its height is 8 cm.

Find its lateral area and its total area.

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A cube of edge length 10 cm and a cuboid its length 8cm; its width 5 cm; its height 17 cm. Calculate the difference between their lateral area.

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A box without a lid its length 16 cm; its width 7 cm; its height 19 cm.

Calculate its lateral area and total area.

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Youssef used a piece of cardboard in the form of rectangle, its length is 1.2m and its width is 80 cm to form a cubed box its edge length is 30 cm.

Calculate the remained paper area after forming the box.

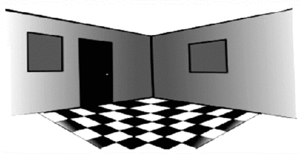
A box truck in the form of cuboid, its inner dimensions are 5 cm, 2.5m and 1.6 m. It is wanted to paint the inner box with paint, the cost price of one square meter is LE 12. Calculate the cost of paint.



A room its length is 5m, its width is 4m, and its height is 3.2m.

It is wanted to paint its latera walls and ceiling.

The cost price of one square meter is LE 8.



Calculate the required cost. Knowing that the room has 2 windows and a door their areas are $8m^2$.

The inner dimensions of a swimming pool are 30m, 10m and 1.5 m .

It is wanted to cover it with a tile of squared shape its side length is 20 cm.

If the cost price of one square meter is LE 32. Calculate the cost of covering its wall and ground.

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A box truck for carrying goods in the form cuboid, its inner dimensions are 4m, 2.5m and 1.8m. It is wanted to cover its side and ceiling with a sheet iron the cost price of square meter is LE 15.

Calculate the cost of required sheet iron.

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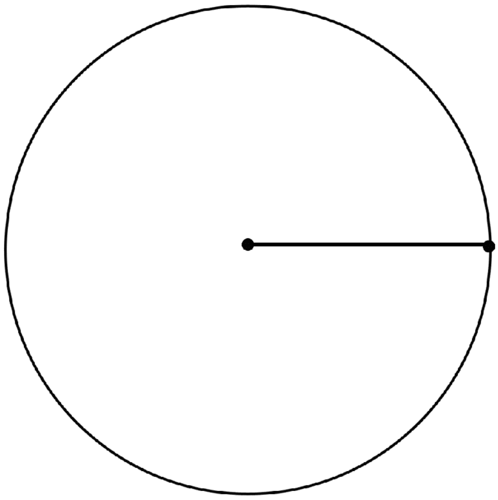
Unit 4

Statistics
And
Probability

Representing the statistical data by using the circular sectors.

The following table shows the percentage of egg production in three farms, a marchent collected these eggs to distribute it on the grocery stores, represent these data by using the circular sectors.

The farm	Frist	Second	Third
The percentage of the production	25%	35%	40%



The measure of the central angle of first =......................= ....

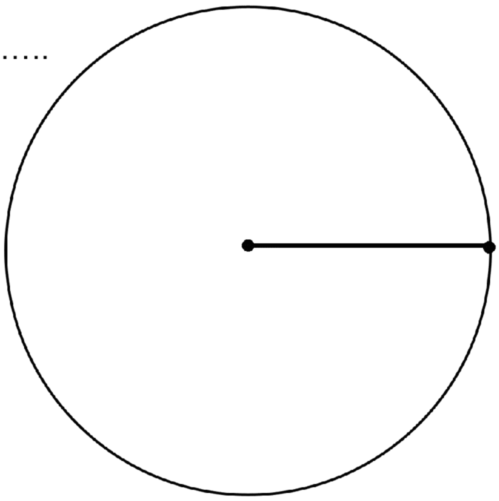
The measure of the central angle of first =......................= ....

The measure of the central angle of first =......................= ....

One of the families spants its salary as the following 40% for food, 20% for house rent, 30% for expenses and save the remainder,

Represent these data by using the circular sectors, then answer the following.

- If the family monthly in come is LE 900, so how much does the family save in the year?
- Another family spends its monthly salary by the same way and save LE 70 monthly, so what the monthly salary of that family?



the ratio of what famil save =......................

The measure of the central angle of food, =......................= ....

The measure of the central angle of house rent =......................= ....

The measure of the central angle of expenses =......................= ....

The measure of the central angle of save =......................= ....

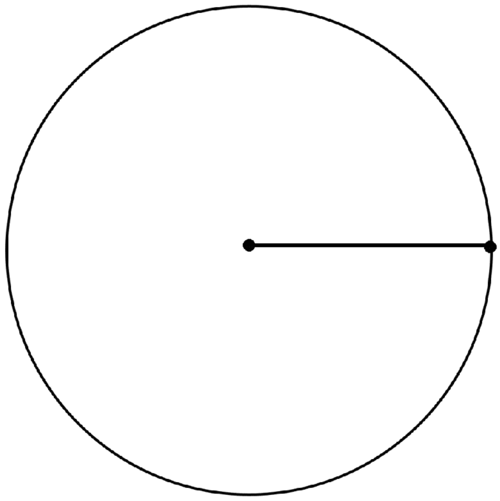
the money family save in the year = ...

The mothly salary of other family = ...

The following table shows the favourite TV programmes which the pupils of one of the classes in the primary six watch as the following.

Kind of programme	Entertaining	Cultural	News	Drama	Sports
Number of hours	9	5	4	7	11

Represent these data by using the circular sectors, then answer the following questions :
What is the programmes that the most of pupils prefer, also the least of pupils prefer?



The measure of the central angle of
Entertaining =......................= ....

The measure of the central angle of
Cultural =......................= ....

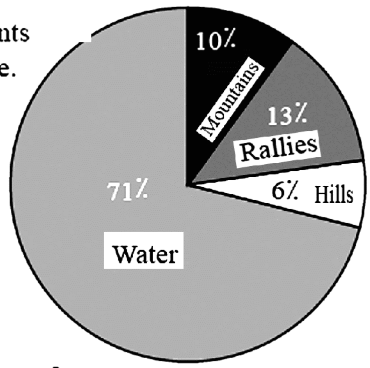
The measure of the central angle of
News =......................= ....

The measure of the central angle of
Drama =......................= ....

The measure of the central angle of
Sports =......................= ....

the most of pupils prefer, also the least of pupils prefer ....

The opposite figure shows the distribution of the natural components of the earth's surface study the figure, then complete the following table.



The components of the earth's surface	Water natural supplies	Vallies	Hills	Mountains
The percentage of the forming	....	....	....	....

- What is the component which represents the smallest ratio of the earth's surface?
- What is the component which represents the greatest ratio of the earth's surface?
- What is the measure of the central angle of the sector of the vallies?

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The random experiment

The random experiment : It is an experiment in which we can determine all its possible outcomes before carrying it, but we can't predict in certainty which of these outcomes will occur when the experiment is carried out.

Random experiment	Possible outcomes
Tossing a coin once	Head (H), Tail (T)
Tossing a die once, observing the number of points on the upper face	1, 2, 3, 4, 5, 6
A ball is selected at random from a box contains three symmetric balls (red, yellow, green)	Red, yellow, green
Carrying a game between your football team, other team from another school	Your team wins, your team is beaten, both of the two teams equalize

Sample space (outcomes) The set of all possible outcomes for a random experiment.

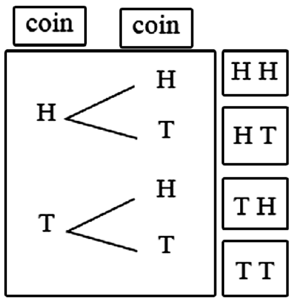
Sample space for tossing a coin once = { H , T }

Example : The random experiment is tossing two distinct coins once, find the sample space.

Solution :

The sample space is {HH, HT, TH, TT}

S = { HH , HT , TH , TT } , n (S) = 4

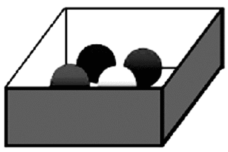


Tossing two coins once is equivalent to tossing a coin two consecutive times,

Sample space for tossing a die once.= { 6 ,5 ,4 ,3 ,2 ,1 }

Example

The random experiment is : selecting a ball from a box contains 4 symmetric balls (red, yellow, green, blue) write the sample space to know the colour of the selected ball.



Solution :

Sample space is : {red, yellow, green, blue).

If the random experiment is tossing a coin two consecutive times under the condition :“appearance of a head only. Write the sample space for this experiment.

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If the random experiment is visiting one of your relatives to know the gender of the child product by his wife. Write the sample space of this experiment.

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In the experiment of selecting a ball from a box contains 3 red balls, 4 yellow balls all ofthem are equal in volume, observing the colour of the selected ball, write the sample space of thisexperiment.

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In the experiment of tossing a die under the condition the number of dots on the upper face is an odd ,”write the sample space.

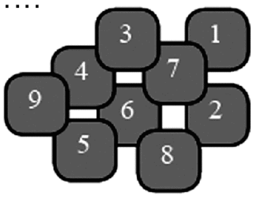
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In the experiment of tossing a die under the condition t“he sum of the dots on the upper two faces is 7”, write the sample space.

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A box contains 9 equal cards, have the same colour, numbered from 1 to 9. Write the sample space for this experiment.

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The random experiment is tossing a coin two consecutive times under the condition appearance of tails only. Write the sample space for this experiment – what is the number of tails in this case?

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The probability

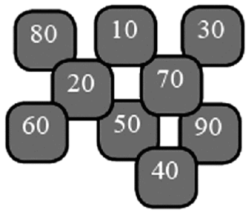
Event : Any outcomes you can get inside a random experiment are called events.

The event : It is a subset of the set of sample space, the number of its elements represents number of times of its occurrence.

The ratio between the number of elements of an event and number of elements of the sample space is called the probability of occurrence of the event, more abbreviation : (probability of the event and is denoted by "p").

$$P(A) = \frac{\text{number of elements of the event (A)}}{\text{number of elements of the sample space}}$$

Example : A box contains 9 symmetric cards each carries a number from the numbers (10 to 90) they are mixed well, then one card is selected at random find the probability of the following events.



1- The event A, where A is a number that is divisible by 5.

2- The event B, where B is a number that is divisible by 3.

3- The event C where C is an odd number.

Solution :

Sample space is S = {10, 20, 30, 40, 50, 60, 70, 80, 90}, n (S) = 9.

- The event A = {10, 20, 30, 40, 50, 60, 70, 80, 90}, n (A) = 9

$$\text{, then } P(A) = \frac{\text{number of elements of the event (A)}}{\text{number of elements of the event (S)}} = \frac{n(A)}{n(S)} = \frac{9}{9} = 1 \quad \text{(certain event)}$$

- The event B = {30, 60, 90} , n (B) = 3

$$\text{Then } P(B) = \frac{\text{number of elements of B}}{\text{number of elements of S}} = \frac{3}{9} = \frac{1}{3} \simeq 0.33 = 33\%$$

- The event C = φ (Impossible event) then n (C) = 0

$$\text{Then } P(C) = \frac{n(C)}{n(S)} = \frac{0}{9} = 0$$

(1) In the experiment of selecting a card at random from 7 equal cards numbered from 1 to 7, writethe sample space, then find the probability of :

- The event A, where A is appearing a number less than 4.
- The event B, where is appearing of an odd number.
- The event C, where C is appearing a number more than 5.

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(2) If the experiment is A“ student is chosen at random from a class of 40 students, 32 students have succeeded in Maths test, 35 students have succeeded in Arabic test find the probability of :

- The event A, where A is the event that he has succeeded in Arabic.
- The event C, where C the event that he has failed in Maths.

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(3) In the experiment of tossing a regular die once and observing the number of dots on the upper face,find the probability of :

- The event A, where A is the event of appearance of a number less than 5.
- The event B, where B is the event of appearance of a number satisfies the inequality $B \geq 3$.

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